AIRBORNE AND SPACEBORNE CLOUD RADAR DESIGNS

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An essential component of the Earth's radiation energy budget is the three-dimensional distribution of radiative heating and cooling of the atmosphere. 'I'odc] ivc. these. quantities, it is necessary to know the global, three-dimensional distributions of clouds. Specifically, the vertical structure Of C] oud S are crucial input to studies of the heating profiles in the atmosphere, the surface radiation budget anti tbc distribution of atmospheric water vapor. Unfortunately, these vertical structure measurements are not available from existing or planned spaceborne remote-sensing instruments. A spaceborne millimeter wave radar has the potential to provide these key cloud measurements.

This paper describes the major design issues associated with a spaceborne cloud radar. In particular, we will discuss the radar frequency selection, the control of surface clutter contamination and its implications on antenna and transmit pulse design, the. tradeoffs between sensitivity and spacecraft resource requirements and the technological challenges for the various radar subsystems and components. Wc will describe a strawman design for such a system, which includes its performance anti expected spacecraft resource consumptions. We have also developed a similar design concept for an airborne cloud mapping radar. The additional design issues associated with the required wick system dynamic range and the selection of proper scheme for Doppler measurements will be summarized.

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